SCIENCE

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THE PRODUCTION OF MUSICAL NOTES FROM NON-MUSICAL SANDS.[1]

THAT I have succeeded in producing musical notes from sand that was never before musical, and am also able to produce similar results from certain mute or "killed" musical sands which have been temporarily deprived of their musical properties, has already been announced in the *Chemical News* (vol. lxiv. No. 1650).

It is not necessary now to give the details of the numerous experiments which led up to this discovery; it will be, perhaps, sufficient for present purposes to state that in November, 1888, I published a paper (read before the Bournemouth Society of Natural Science) in which I propounded a theory to account for the cause of musical sounds issuing from certain sands. After giving various reasons for my conclusions, I said: "It occurred to me, then, that the music from sand was simply the result of the rubbing together of the surfaces of millions of perfectly clean grains of quartz, free from angularities, roughness, or adherent matter in the form of clinging fragments investing the grains, and that these microlithic emissions of sound, though individually inaudible, might in combination produce a note sufficiently powerful to be sensible to us."

Having described numerous experiments, and drawn attention to the hopeful results obtained from the "millet-seed" sand, my paper concluded with the following: "From what I have now told you, I think we may conclude that music may be produced from sand if (1) the grains are rounded, polished, and free from fine fragments; (2) if they have a sufficient amount of 'play' to enable them to slide one against the other; (3) if the grains are perfectly clean; and (4) if they possess a certain degree of uniformity in size, and are within a certain range in size."

On June 20 last I visited Studland Bay for the purpose of carrying out some new experiments. I found that the musical patch emitted tones louder and more pronounced than I had ever heard them before. The best results were obtained by drawing a thick deal rod, on to the end of which I had fixed a resonator, over the surface of the sand; sounds produced in this way were heard unmistakably for a considerable distance. The patch averaged 7½ yards in width, and ran parallel with the trend of the shore for some hundreds of yards. The sand on the sea side of the patch was fine, and emitted notes of a high pitch; that on the land side was coarse, and emitted notes of a lower pitch. The rod drawn across the patch gave, therefore, a great variety of pitch. Many other interesting facts cannot now be referred to, but it is important to state that some of this sand, when taken off the patch and struck in a box, gave out notes as it did *in situ*. On trying this sand subsequently at home, the coarse emitted distinct notes of a low pitch, but the fine was mute. This was, so far as I know, the first time that the Studland sand had been musical off the patch.

According to my theory, if the number of grains with the polished surfaces could be increased in this fine sand, the number of vibrations would increase also, and so intensify the note, and cause it to become audible; this could only be done, however, by introducing a certain percentage of grains fulfilling the required conditions. To obtain such grains and to introduce them gradually until the necessary number should have been added, would have been a tedious process; and it occurred to me then that the same result might be obtained if the sand were struck in a vessel with a hard and polished interior. I placed, therefore, this fine sand in a teacup, and, on striking it, found that it emitted a high, shrill note (A in *altissimo*), which was far more intense than that given when it formed a part of the patch.

When polished grains of sand are in contact with the sides and bottom of a glazed porcelain vessel, it is obvious that there are numerous points of contact between two polished surfaces, — the sand grains and the vessel, — and that on striking the surface of the sand, the friction necessary to produce the vibrations of a musical note is induced between these points.

This I proved by placing the same sand in various vessels with rough interiors, and by lining these glazed or polished vessels with silk, etc., but in no case would this sand emit notes unless the grains were in direct contact with the glazed or polished surfaces. This peculiarity is not in any way dependent upon the sonorous properties of the vessel used, for it may be "deadened" with impunity, and the note will remain unaltered.

The results of numerous experiments show that musical sand of the Eigg type — i.e., sand possessing in great perfection the physical conditions necessary for the production of music — will be musical in receptacles of whatever composition or form, though in some of these it emits notes "under protest" only.

Those sands which are of the Studland Bay type — i.e., having the necessary physical conditions less perfectly developed, and usually mute except *in situ* — will emit music only in vessels possessing hard and glazed interiors, and, as a rule, of a certain form; while some of the more "sulky" types of sand not only need a vessel of hard and glazed interior, and definite form, but also require a box, or small pedestal of wood (which I call a "coaxer"), on which this vessel must stand before the notes emitted become audible. A "sulky" sand was rendered far more musical by being sifted, washed, and boiled, giving out, after this treatment, notes without the aid of the "coaxer."

After discovering what could be done with such simple apparatus, it occurred to me to try, under similar conditions, some of my abandoned sands — those unmusical sands that had been, during a period of four or five years, treated unsuccessfully for music.

One sand (an iron-sand composed of more or less polished grains, quartz, and much dust formed of denser minerals) gave a very hopeful "swish" (explained in my paper of 1888) in a certain porcelain vessel, and from this — by (1) sifting in sieves, to eliminate the fine material, and to insure uniformity in size of grain; (2) rolling down an inclined plane of frosted glass, to separate the rounded grains from the angular quartz; and (3) boiling in dilute hydrochloric acid, to cleanse the surfaces — I succeeded in producing a sand that, in certain glazed vessels, emits musical notes as clear as those emitted from any of my musical sands but that of Eigg. This sand gives F in *altissimo*, but it soon becomes "killed" because of the fine dust and loss of polish that is the inevitable result of the attrition of the grains. There remains but one thing to be done, and that is to produce a sand which, like that of Eigg, will be musical in almost any receptacle, and I have reason now to think that this will not be very difficult.

It has not been possible here to record more than the merest outline of what has been done, or to give instances of the interesting capriciousness of these sands; it should be understood, however, that no ordinary beach or cliff sand has the slightest inclination to "sing" under any of the "coaxing" methods at present known to me.

[1] Cecil Carus-Wilson, in Nature of Aug. 6.

IT is stated in *Nature* that Siam, following the example of Japan, is commencing to Europeanize her institutions. The founding of a university has been decided upon, and Professor Haase of Königsberg has accepted the appointment to the chair of physics.